

# PATENT ABSTRACTS OF JAPAN

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(71)Applicant : SUMITOMO WIRING SYST LTD

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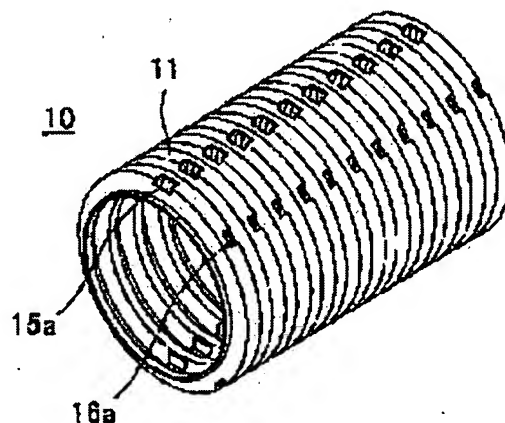
(72)Inventor : KAWAMURA MASATO

## (54) CORRUGATED TUBE FOR ARMORING WIRE HARNESS

### (57)Abstract:

PROBLEM TO BE SOLVED: To reduce the quantity of a corrugated tube used.

SOLUTION: A corrugated tube 10 for mounting wire harness, composed of alternately and continuously formed crest sections 11 and valley sections 12 and made of a synthetic resin, has holes 15a and 16a for partially reducing the weight of the tube 10 in the upper half sections of the slopes from the upper end faces of the crest sections to the lower end faces of the valley sections. The upper ends of the holes 15a and 16a are continuously formed from the holes formed in one-side corner sections of the upper end faces of the crest sections 11. In addition, a plurality of holes 15a and 16a is arranged at intervals on the same circumference, with adjacent holes being provided on the opposite slopes.



## LEGAL STATUS

[Date of request for examination]

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application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

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CLAIMS

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[Claim(s)]

[Claim 1] The corrugate tube for wire harness sheathing which is the slant face which continues the upper bed side of above-mentioned Yamabe of the outermost periphery, and the soffit side of the above-mentioned trough of the most inner circumference in the corrugate tube for wire harness sheathing made of synthetic resin with which Yamabe and a trough were continued and prepared in the die-length direction by turns, and is characterized by having prepared [ to ] the hole for lightweight-izing selectively while arriving at the above-mentioned soffit side from the upper bed of the above-mentioned slant face.

[Claim 2] The upper bed of the above-mentioned hole is a corrugate tube for wire harness sheathing according to claim 1 made to follow the hole prepared in the 1 side corner of Yamabe's upper bed side.

[Claim 3] The hole which adjoins while the above-mentioned hole opens spacing and prepares it on the same periphery is a corrugate tube for wire harness sheathing according to claim 1 or 2 prepared in the slant face of an opposite hand. [ two or more ]

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention attains lightweight-ization of this corrugate tube especially about the corrugate tube which carries out sheathing, in order to protect the wire harness \*\*\*\*(ed) by the automobile.

[0002]

[Description of the Prior Art] Conventionally, in order to protect the electric-wire group which constitutes wire harness from interference with the body and a device, sheathing of the corrugate tube made of synthetic resin which has rigidity is carried out to the wire harness \*\*\*\*(ed) by the automobile. As shown in drawing 7 (A), (B), and (C), the corrugate tube 1 was made to continue in the die-length direction, has prepared Yamabe 1a and trough 1b by turns, and it has protected the electric-wire group, giving flexibility.

[0003] As shown in drawing 8, this kind of corrugate tube 1 was connected also with the polyvinyl chloride tube 2, and has protected the electric-wire group in the junction location with the polyvinyl chloride tube 2 grade which is carrying out sheathing to the electric-wire group W of the wire harness which \*\*\*\* into the part in which external interference material, such as metal, is located and which carried out sheathing to other electric-wire groups while fixing to an electric-wire group using a tape 3.

[0004]

[Problem(s) to be Solved by the Invention] Since environmental protection is thought as important in recent years, improvement in fuel consumption is called for from the point of fuel economy. In order to raise fuel consumption, lightweight-izing of an automobile is required, and lightweight-ization to the component part of an automobile is demanded from the point. Therefore, lightweight-ization is called for also in the wire harness which is the component part of an automobile, and it is necessary to also lightweight-ize the corrugate tube attached to wire harness.

[0005] Although thinning is well used as the technique of lightweight-izing, the thickness of a corrugate tube is usually as thin as 0.27mm, and since abrasion resistance is also required of a corrugate tube, the thing beyond this to do for thinning is difficult.

[0006] It is making for this invention to attain lightweight-ization of a corrugate tube, without not having been made in view of the above-mentioned problem, and carrying out thinning into the technical problem.

[0007]

[Means for Solving the Problem] In the corrugate tube for wire harness sheathing made of synthetic resin with which Yamabe and a trough continued in the die-length direction by turns, and this invention was prepared in order to solve the above-mentioned technical problem It is the slant face which continues the upper bed side of above-mentioned Yamabe of the outermost periphery, and the soffit side of the above-mentioned trough of the most inner circumference, and the corrugate tube for wire harness sheathing characterized by having prepared [ to ] the hole for lightweight-izing selectively is offered while arriving at the above-mentioned soffit side from the upper bed of the above-mentioned slant face.

[0008] As mentioned above, if spacing is opened and a hole is prepared also on the same periphery while preparing a hole in each slant face which only the surface integral of a hole can attain lightweight-ization, and continues in the die-length direction, if a hole is prepared in the slant face which continues Yamabe and a trough, many holes will be prepared and 10% - about 30% of lightweight-ization can be conventionally attained as compared with elegance. And since it has not opened in the soffit side of a trough, a hole does not contact the electric-wire group which the edge of a hole lets pass inside.

[0009] In addition, in the case of the corrugate tube with a slit which has the slit to which the corrugate tube continued in the die-length direction, the above-mentioned hole is prepared in the location of a slit, and the location from which it separated.

[0010] The upper bed of the hole prepared in the above-mentioned slant face may make the hole prepared in the 1 side corner of Yamabe's upper bed side follow. That is, even if it opens a hole only in a slant face, area is narrow, since [ as for which weight relief-ization becomes empty ] there is nothing, the 1 side corner of Yamabe's upper bed side may be made to follow the hole of a slant face, and a hole may be formed. In this case, the hole prepared in the corner of an upper bed side is used as the small hole which is extent which cannot insert external interference material as 0.3mm - about 0.5mm. Moreover, in order that making some holes eat also into an upper bed side may pierce it after the hole of a slant face fabricates a corrugate tube, and it may form it by processing in this way, it is because it is difficult to open a hole only in a slant face, and it is because the direction pierced and processed from the 1 side corner of an upper bed side can process it easily.

[0011] While the above-mentioned hole opens spacing and prepares it on the same periphery, the adjoining hole is prepared in the slant face of an opposite hand. [ two or more ]

[0012] Thus, a hole is not opened only in a same the slant face between Yamabe and a trough side, but if spacing is opened and prepared in both sides by turns, the balance of the reinforcement of a corrugate tube can be maintained.

[0013]

[Embodiment of the Invention] Hereafter, the operation gestalt of this invention is explained with reference to a drawing. The corrugate tube 10 of the 1st operation gestalt which is fabricating the corrugate tube 10 with the synthetic resin which has rigidity, and is shown in drawing 1 thru/or drawing 5 is a type without a slit. Yamabe 11 and a trough 12 continue in the die-length direction L by turns at the time of shaping, and the corrugate tube 10 is carried out that it is easy to make it crooked in a bellows configuration. Since upper bed side 11a of Yamabe 11 located in the outermost periphery and soffit side 12a of the trough 12 located in the most inner circumference make Yamabe 11 abbreviation trapezoidal shape, it becomes a slant face 13 and slant faces 13A and 13B will exist in one both sides of Yamabe 12. [0014] While continues one Yamabe 11 who projects in the above-mentioned annulus ring configuration, and the trough 12 cut in the annulus ring configuration which adjoins Yamabe's 11 1 this one side, three holes 15A, 15B, and 15C for lightweight are opened in a hoop direction, and spacing is formed in slant-face 13A. Three holes 16A, 16B, and 16C for lightweight were opened also in slant-face 13B of another side which continues the trough 12 which adjoins another side of this crest section 11, spacing was opened in the hoop direction, and it has prepared. Therefore, a total of six holes 15A-15C, and 16A-16C are prepared in one both sides of Yamabe 11. The trough 12 was separated in the die-length direction, and six holes for lightweight are prepared in Yamabe's 11 both sides also like each \*\*\*\* 11 which opens and prepares spacing.

[0015] The holes 15A-15C by the side of slant-face 13A of the method of up Norikazu and the holes 16A-16B by the side of slant-face 13B of another side are formed by turns, and are formed in a hoop direction in order of Holes 15A, 16A, 15B, 16B, 15C, and 16C.

[0016] As the above-mentioned holes 15A-15C, and 16A-16C (it explains as a hole 15 hereafter) reach soffit side 12a from the above-mentioned up end-face 11a on the slant face 13 which continues upper bed side 11a of Yamabe 11 of the outermost periphery, and soffit side 12a of the trough 12 of the most inner circumference so that it may expand to drawing 5 and may be shown, they have formed [ by ] the hole 15. That is, it does not prepare in the whole slant face 13, but he opens selectively, and is trying for a hole 15 not to reach soffit side 12a. Thus, it will be because there is a possibility of contacting the wire

harness which the edge of a hole 15 makes inserting in the interior of a corrugate tube 10 not to form a hole 15 to a soffit side, if a hole 15 is formed to a soffit side.

[0017] In upper bed side 11a, each above-mentioned hole 15 eats away and forms only few dimensions L1 (this operation gestalt 0.3mm) of 0.3mm - about 0.5mm in upper bed side 11a, makes hole 15a of the corner of upper bed side 11a follow hole 15b to the middle of a field 13, and forms one hole 15. In addition, although upper bed side 11a tends to interfere with external interference material, since external interference material is not by insertion in a corrugate tube 10 from these hole 15a only by having prepared 0.3mm - about 0.5mm hole 15a as mentioned above, it is satisfactory even if it prepares hole 15a in the corner of upper bed side 11a. The dimension (height) L2 from the upper bed of each hole 15 to a soffit is 1-3mm, and is set to 1mm with this operation gestalt.

[0018] After the above-mentioned hole 15 (15A-15C, 16A-16C) carries out resin shaping of the corrugate tube 10, it is drilled by punching processing. Since it is difficult to open a hole 15 only in a slant face 13 when preparing by this punching processing, hole 15a is made to eat into upper bed side 11a slightly as mentioned above. Moreover, the area of a hole 15 increases and the direction which prepares hole 15a also in upper bed side 11a can contribute to lightweight-ization rather than preparing hole 15b only in a slant face 13 selectively in this way.

[0019] The weight of a corrugate tube 10 is mitigable 10% to 30% by preparing the above-mentioned holes 15A-15C, and 16A-16C. In addition, by preparing Holes 15A-15C, and 16A-16C, in a water-ed field, since flooding is generated from a hole, it is not desirable. Therefore, as for the corrugate tube which opens the above-mentioned hole, preparing in a non-\*\*\*\* field is desirable. In addition, even if flooding is generated from a hole, it can discharge from other holes and water will not collect inside a corrugate tube.

[0020] Drawing 6 is corrugate-tube 10with slit' which formed the slit 20 which continued in the die-length direction in corrugate-tube 10'. He prepares in other parts and is trying not to make a slit 20 follow a hole 15, without forming a hole 15 at the part of a slit 20 in this corrugate-tube 10with slit'.

[0021] In addition, with the above-mentioned operation gestalt, in one both sides of Yamabe, although six holes 15A-15C in all, and 16A-16C are prepared, the number of a hole may not be limited, but two pieces, four pieces, eight pieces, etc. are sufficient, and in order to maintain the balance on reinforcement, it is desirable to prepare in the position of symmetry on both sides of the main shaft of a corrugate tube as an even-piece number.

[0022]

[Effect of the Invention] Since the hole for lightweight is selectively opened by the middle which does not reach a soffit side on the slant face which continues the upper bed side of Yamabe of the outermost periphery of a corrugate tube, and the soffit side of the trough of the most inner circumference according to this invention so that more clearly than the above explanation, streamlining of a corrugate tube can be attained. Since the edge of a hole etc. was not made to interfere in the wire harness inserted in the interior since he is trying for especially a hole not to reach the soffit side of a trough and the 0.3mm - about 0.5mm very small hole has also only opened Yamabe's upper bed side in the corner section, it can prevent that external shock absorbing material inserts from a hole, and is satisfactory also at these points.

[0023] Moreover, since that which adjoins the hole prepared in Yamabe's both sides makes the location of a hole reverse, the balance on reinforcement can also be maintained.

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TECHNICAL FIELD

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[Field of the Invention] This invention attains lightweight-ization of this corrugate tube especially about the corrugate tube which carries out sheathing, in order to protect the wire harness \*\*\*\*(ed) by the automobile.

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PRIOR ART

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[0003] As shown in drawing 8, this kind of corrugate tube 1 was connected also with the polyvinyl chloride tube 2, and has protected the electric-wire group in the junction location with the polyvinyl chloride tube 2 grade which is carrying out sheathing to the electric-wire group W of the wire harness which \*\*\*\* into the part in which external interference material, such as metal, is located and which carried out sheathing to other electric-wire groups while fixing to an electric-wire group using a tape 3.

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EFFECT OF THE INVENTION

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[Effect of the Invention] Since the hole for lightweight is selectively opened by the middle which does not reach a soffit side on the slant face which continues the upper bed side of Yamabe of the outermost periphery of a corrugate tube, and the soffit side of the trough of the most inner circumference according to this invention so that more clearly than the above explanation, streamlining of a corrugate tube can be attained. Since the edge of a hole etc. was not made to interfere in the wire harness inserted in the interior since he is trying for especially a hole not to reach the soffit side of a trough and the 0.3mm - about 0.5mm very small hole has also only opened Yamabe's upper bed side in the corner section, it can prevent that external shock absorbing material inserts from a hole, and is satisfactory also at these points.

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TECHNICAL PROBLEM

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[Problem(s) to be Solved by the Invention] Since environmental protection is thought as important in recent years, improvement in fuel consumption is called for from the point of fuel economy. In order to raise fuel consumption, lightweight-izing of an automobile is required, and lightweight-ization to the component part of an automobile is demanded from the point. Therefore, lightweight-ization is called for also in the wire harness which is the component part of an automobile, and it is necessary to also lightweight-ize the corrugate tube attached to wire harness.

[0005] Although thinning is well used as the technique of lightweight-izing, the thickness of a corrugate tube is usually as thin as 0.27mm, and since abrasion resistance is also required of a corrugate tube, the thing beyond this to do for thinning is difficult.

[0006] It is making for this invention to attain lightweight-ization of a corrugate tube, without not having been made in view of the above-mentioned problem, and carrying out thinning into the technical problem.

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MEANS

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[Means for Solving the Problem] In the corrugate tube for wire harness sheathing made of synthetic resin with which Yamabe and a trough continued in the die-length direction by turns, and this invention was prepared in order to solve the above-mentioned technical problem It is the slant face which continues the upper bed side of above-mentioned Yamabe of the outermost periphery, and the soffit side of the above-mentioned trough of the most inner circumference, and the corrugate tube for wire harness sheathing characterized by having prepared [ to ] the hole for lightweight-izing selectively is offered while arriving at the above-mentioned soffit side from the upper bed of the above-mentioned slant face.

[0008] As mentioned above, if spacing is opened and a hole is prepared also on the same periphery while preparing a hole in each slant face which only the surface integral of a hole can attain lightweight-ization, and continues in the die-length direction, if a hole is prepared in the slant face which continues Yamabe and a trough, many holes will be prepared and 10% - about 30% of lightweight-ization can be conventionally attained as compared with elegance. And since it has not opened in the soffit side of a trough, a hole does not contact the electric-wire group which the edge of a hole lets pass inside.

[0009] In addition, in the case of the corrugate tube with a slit which has the slit to which the corrugate tube continued in the die-length direction, the above-mentioned hole is prepared in the location of a slit, and the location from which it separated.

[0010] The upper bed of the hole prepared in the above-mentioned slant face may make the hole prepared in the 1 side corner of Yamabe's upper bed side follow. That is, even if it opens a hole only in a slant face, area is narrow, since [ as for which weight relief-ization becomes empty ] there is nothing, the 1 side corner of Yamabe's upper bed side may be made to follow the hole of a slant face, and a hole may be formed. In this case, the hole prepared in the corner of an upper bed side is used as the small hole which is extent which cannot insert external interference material as 0.3mm - about 0.5mm. Moreover, in order that making some holes eat also into an upper bed side may pierce it after the hole of a slant face fabricates a corrugate tube, and it may form it by processing in this way, it is because it is difficult to open a hole only in a slant face, and it is because the direction pierced and processed from the 1 side corner of an upper bed side can process it easily.

[0011] While the above-mentioned hole opens spacing and prepares it on the same periphery, the adjoining hole is prepared in the slant face of an opposite hand. [ two or more ]

[0012] Thus, a hole is not opened only in a same the slant face between Yamabe and a trough side, but if spacing is opened and prepared in both sides by turns, the balance of the reinforcement of a corrugate tube can be maintained.

[0013]

[Embodiment of the Invention] Hereafter, the operation gestalt of this invention is explained with reference to a drawing. The corrugate tube 10 of the 1st operation gestalt which is fabricating the corrugate tube 10 with the synthetic resin which has rigidity, and is shown in drawing 1 thru/or drawing 5 is a type without a slit. Yamabe 11 and a trough 12 continue in the die-length direction L by turns at the time of shaping, and the corrugate tube 10 is carried out that it is easy to make it crooked in a bellows configuration. Since upper bed side 11a of Yamabe 11 located in the outermost periphery and

soffit side 12a of the trough 12 located in the most inner circumference make Yamabe 11 abbreviation trapezoidal shape, it becomes a slant face 13 and slant faces 13A and 13B will exist in one both sides of Yamabe 12.

[0014] While continues one Yamabe 11 who projects in the above-mentioned annulus ring configuration, and the trough 12 cut in the annulus ring configuration which adjoins Yamabe's 11 1 this one side, three holes 15A, 15B, and 15C for lightweight are opened in a hoop direction, and spacing is formed in slant-face 13A. Three holes 16A, 16B, and 16C for lightweight were opened also in slant-face 13B of another side which continues the trough 12 which adjoins another side of this crest section 11, spacing was opened in the hoop direction, and it has prepared. Therefore, a total of six holes 15A-15C, and 16A-16C are prepared in one both sides of Yamabe 11. The trough 12 was separated in the die-length direction, and six holes for lightweight are prepared in Yamabe's 11 both sides also like each \*\*\*\* 11 which opens and prepares spacing.

[0015] The holes 15A-15C by the side of slant-face 13A of the method of up Norikazu and the holes 16A-16B by the side of slant-face 13B of another side are formed by turns, and are formed in a hoop direction in order of Holes 15A, 16A, 15B, 16B, 15C, and 16C.

[0016] As the above-mentioned holes 15A-15C, and 16A-16C (it explains as a hole 15 hereafter) reach soffit side 12a from the above-mentioned up end-face 11a on the slant face 13 which continues upper bed side 11a of Yamabe 11 of the outermost periphery, and soffit side 12a of the trough 12 of the most inner circumference so that it may expand to drawing 5 and may be shown, they have formed [ by ] the hole 15. That is, it does not prepare in the whole slant face 13, but he opens selectively, and is trying for a hole 15 not to reach soffit side 12a. Thus, it will be because there is a possibility of contacting the wire harness which the edge of a hole 15 makes inserting in the interior of a corrugate tube 10 not to form a hole 15 to a soffit side, if a hole 15 is formed to a soffit side.

[0017] In upper bed side 11a, each above-mentioned hole 15 eats away and forms only few dimensions L1 (this operation gestalt 0.3mm) of 0.3mm - about 0.5mm in upper bed side 11a, makes hole 15a of the corner of upper bed side 11a follow hole 15b to the middle of a field 13, and forms one hole 15. In addition, although upper bed side 11a tends to interfere with external interference material, since external interference material is not by insertion in a corrugate tube 10 from these hole 15a only by having prepared 0.3mm - about 0.5mm hole 15a as mentioned above, it is satisfactory even if it prepares hole 15a in the corner of upper bed side 11a. The dimension (height) L2 from the upper bed of each hole 15 to a soffit is 1-3mm, and is set to 1mm with this operation gestalt.

[0018] After the above-mentioned hole 15 (15A-15C, 16A-16C) carries out resin shaping of the corrugate tube 10, it is drilled by punching processing. Since it is difficult to open a hole 15 only in a slant face 13 when preparing by this punching processing, hole 15a is made to eat into upper bed side 11a slightly as mentioned above. Moreover, the area of a hole 15 increases and the direction which prepares hole 15a also in upper bed side 11a can contribute to lightweight-ization rather than preparing hole 15b only in a slant face 13 selectively in this way.

[0019] The weight of a corrugate tube 10 is mitigable 10% to 30% by preparing the above-mentioned holes 15A-15C, and 16A-16C. In addition, by preparing Holes 15A-15C, and 16A-16C, in a water-ed field, since flooding is generated from a hole, it is not desirable. Therefore, as for the corrugate tube which opens the above-mentioned hole, preparing in a non-\*\*\*\* field is desirable. In addition, even if flooding is generated from a hole, it can discharge from other holes and water will not collect inside a corrugate tube.

[0020] Drawing 6 is corrugate-tube 10with slit' which formed the slit 20 which continued in the die-length direction in corrugate-tube 10'. He prepares in other parts and is trying not to make a slit 20 follow a hole 15, without forming a hole 15 at the part of a slit 20 in this corrugate-tube 10with slit'.

[0021] In addition, with the above-mentioned operation gestalt, in one both sides of Yamabe, although six holes 15A-15C in all, and 16A-16C are prepared, the number of a hole may not be limited, but two pieces, four pieces, eight pieces, etc. are sufficient, and in order to maintain the balance on reinforcement, it is desirable to prepare in the position of symmetry on both sides of the main shaft of a corrugate tube as an even-piece number.

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DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] It is the perspective view showing the corrugate tube of the operation gestalt of this invention.

[Drawing 2] It is the top view of drawing 1 .

[Drawing 3] It is the side elevation of drawing 2 .

[Drawing 4] It is the front view of drawing 2 .

[Drawing 5] It is an important section expanded sectional view.

[Drawing 6] It is the drawing in which other operation gestalten are shown.

[Drawing 7] (A), (B), and (C) are drawings in which the conventional example is shown.

[Drawing 8] It is the perspective view showing the example of an application of the conventional example.

[Description of Notations]

10 Corrugate Tube

11 Yamabe

11a Upper bed side

12 Trough

12a Soffit side

13 Slant Face

15A-15C, 16A-16C Hole for lightweight

20 Slit

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[Translation done.]

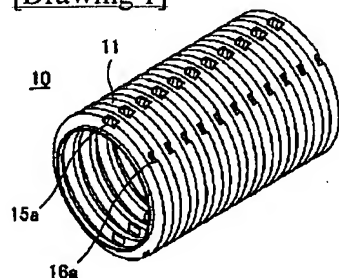
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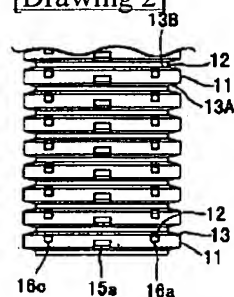
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## DRAWINGS

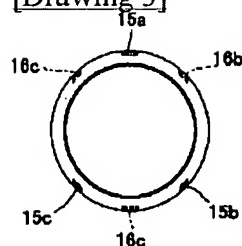
[Drawing 1]



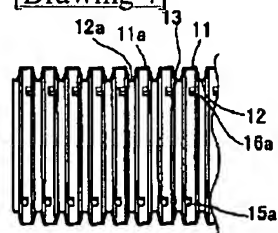
[Drawing 2]



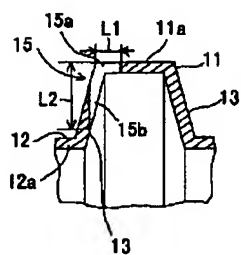
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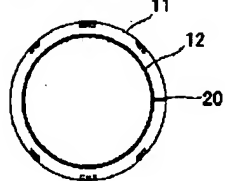
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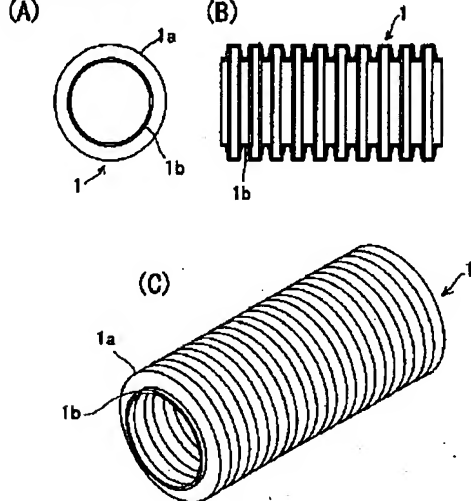
[Drawing 5]



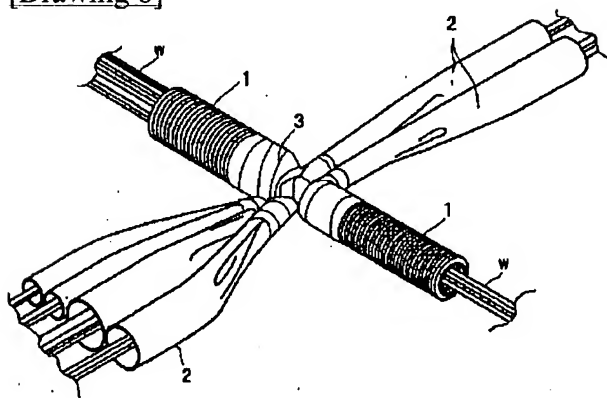
[Drawing 6]



[Drawing 7]



[Drawing 8]



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(71)出願人 000183406

住友電装株式会社

三重県四日市市西末広町1番14号

(72)発明者 河村 誠人

三重県四日市市西末広町1番14号 住友電装株式会社内

(74)代理人 100072660

弁理士 大和田 和美

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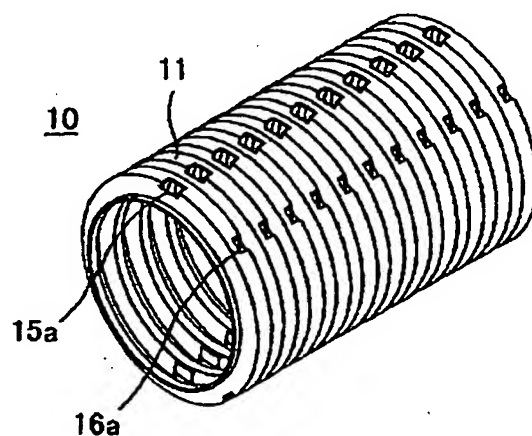
DD10 DE10

(54)【発明の名称】 ワイヤハーネス外装用のコルゲートチューブ

(57)【要約】

【課題】 コルゲートチューブの減量化を図る。

【解決手段】 山部11と谷部12とが交互に長さ方向に連続して設けられた合成樹脂製のワイヤハーネス外装用のコルゲートチューブ10において、山部の上端面と谷部の下端面とを連続する斜面で、且つ、斜面上端から上記下端面に達する途中まで部分的に軽量化用の孔15、16を設けている。かつ、この孔の上端は、山部の上端面の一侧隅部に設けた孔と連続させている。また、孔は同一円周上において間隔をあけて複数個設けると共に、隣接する孔は反対側の斜面に設けている。



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## 【特許請求の範囲】

【請求項1】 山部と谷部とが交互に長さ方向に連続して設けられた合成樹脂製のワイヤハーネス外装用のコルゲートチューブにおいて、

最外周の上記山部の上端面と最内周の上記谷部の下端面とを連続する斜面で、且つ、上記斜面の上端から上記下端面に達する途中まで部分的に軽量化用の孔を設けていることを特徴とするワイヤハーネス外装用のコルゲートチューブ。

【請求項2】 上記孔の上端は、山部の上端面の一侧隅部に設けた孔と連続させている請求項1に記載のワイヤハーネス外装用のコルゲートチューブ。

【請求項3】 上記孔は同一円周上において間隔をあけて複数個設けると共に、隣接する孔は反対側の斜面に設けている請求項1または請求項2に記載のワイヤハーネス外装用のコルゲートチューブ。

## 【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は自動車に配索されるワイヤハーネスを保護するために外装するコルゲートチューブに関し、特に、該コルゲートチューブの軽量化を図るものである。

【0002】

【従来の技術】従来、自動車に配索されるワイヤハーネスには、ワイヤハーネスを構成する電線群をボディや機器との干渉から保護するために、剛性を有する合成樹脂製のコルゲートチューブを外装している。図7(A)

(B)(C)に示すようにコルゲートチューブ1は長さ方向に連続させて、山部1aと谷部1bとを交互に設けており、屈曲性を持たせながら、電線群を保護している。

【0003】この種のコルゲートチューブ1は、例えば、図8に示すように、金属製の外部干渉材が位置する部分に配索するワイヤハーネスの電線群Wに外装しており、他の電線群に外装したビニルチューブ2等との接合位置では、テープ3を用いて電線群に固定すると共に、ビニルチューブ2とも連結して、電線群を保護している。

【0004】

【発明が解決しようとする課題】近年、環境保護が重視されているため、燃料節約の点から燃費の向上が求められている。燃費を向上させるために自動車の軽量化が必要で、その点から自動車の構成部品に対する軽量化が要求されている。よって、自動車の構成部品であるワイヤハーネスにおいても軽量化が求められ、ワイヤハーネスに付設するコルゲートチューブも軽量化する必要がある。

【0005】軽量化の手法としては薄肉化が良く用いられるが、コルゲートチューブの肉厚は通常0.27mmと薄く、コルゲートチューブには耐摩耗性も要求される

ため、これ以上の薄肉化することは困難である。

【0006】本発明は上記した問題に鑑みてなされたもので、薄肉化せずにコルゲートチューブの軽量化を図ることを課題としている。

【0007】

【課題を解決するための手段】上記課題を解決するため、本発明は、山部と谷部とが交互に長さ方向に連続して設けられた合成樹脂製のワイヤハーネス外装用のコルゲートチューブにおいて、最外周の上記山部の上端面と最内周の上記谷部の下端面とを連続する斜面で、且つ、上記斜面の上端から上記下端面に達する途中まで部分的に軽量化用の孔を設けていることを特徴とするワイヤハーネス外装用のコルゲートチューブを提供している。

【0008】上記のように、山部と谷部とを連続する斜面上に孔を設けると、孔の面積分だけ軽量化を図ることができ、かつ、長さ方向に連続する各斜面上に孔を設けると共に、同一円周上にも間隔をあけて孔を設けると、多数の孔が設けられることとなり、従来品と比較して10%～30%程度の軽量化を図ることができる。しかも、孔は谷部の下端面にあけていないため、孔のエッジが内部に通す電線群に接触することはない。

【0009】なお、コルゲートチューブが長さ方向に連続したスリットを有するスリット付きコルゲートチューブの場合には、スリットの位置と外れた位置に上記孔を設けている。

【0010】上記斜面上に設ける孔の上端は、山部の上端面の一侧隅部に設けた孔と連続させてもよい。即ち、斜面のみに孔をあけても、面積が狭く、重量軽減化がすぐれないために、山部の上端面の一侧隅部を斜面の孔と連続させて孔を形成してもよい。この場合には、上端面の隅部に設ける孔は0.3mm～0.5mm程度として、外部干渉材が挿入できない程度の小さい孔としている。また、このように、上端面にも孔の一部を食い込ませているのは、斜面の孔はコルゲートチューブを成形した後に打ち抜き加工で形成するため、斜面のみに孔をあけることは難しいためであり、上端面の一侧隅部から打ち抜き加工の方が加工が容易に行えることによる。

【0011】上記孔は同一円周上において間隔をあけて複数個設けると共に、隣接する孔は反対側の斜面に設けている。

【0012】このように、山部と谷部との間の斜面の同一側にのみ孔をあけるのではなく、両側に交互に間隔をあけて設けると、コルゲートチューブの強度のバランスを保つことができる。

【0013】

【発明の実施の形態】以下、本発明の実施形態を図面を参照して説明する。コルゲートチューブ10は剛性を有する合成樹脂で成形しており、図1乃至図5に示す第1実施形態のコルゲートチューブ10はスリットなしでタ

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イブである。コルゲートチューブ10は成形時においては、山部11と谷部12とが交互に長さ方向Lに連続して蛇腹形状で屈曲させ易くしている。最外周に位置する山部11の上端面11aと最内周に位置する谷部12の下端面12aとは、山部11を略台形状としているために、斜面13となり、1つの山部12の両側に斜面13Aと13Bが存在することとなる。

【0014】上記円環形状に突出される1つの山部11と、この1つの山部11の一侧に隣接する円環形状に凹設される谷部12とを連続する一方の斜面13Aには3個の軽量用の孔15A、15B、15Cを周方向に間隔をあけて形成している。該山部11の他方に隣接する谷部12とを連続する他方の斜面13Bにも3個の軽量用の孔16A、16B、16Cを周方向に間隔をあけて設けている。よって、1つの山部11の両側に合計6個の孔15A～15C、16A～16Cが設けられている。長さ方向に谷部12を隔てて間隔をあけて設ける各山部11にも同様に山部11の両側に6個の軽量用の孔を設けている。

【0015】上記一方の斜面13A側の孔15A～15Cと他方の斜面13B側の孔16A～16Bは交互に設け、周方向に、孔15A、16A、15B、16B、15C、16Cの順序で形成している。

【0016】上記孔15A～15C、16A～16C（以下、孔15として説明する）は、図5に拡大して示すように、最外周の山部11の上端面11aと最内周の谷部12の下端面12aとを連続する斜面13において、上記上端面11aより下端面12aに達する途中までに孔15を設けている。即ち、斜面13の全体に設けず、部分的にあけて、孔15が下端面12aに達しないようにしている。このように、下端面まで孔15を設けないのは、下端面まで孔15を設けると、孔15のエッジがコルゲートチューブ10の内部に挿通させるワイヤハーネスに接触する恐れがあることによる。

【0017】上記各孔15は、上端面11aでは、0.3mm～0.5mm程度の僅かな寸法L1（本実施形態では0.3mm）だけ上端面11aに食い込んで形成し、上端面11aの隅部の孔15aを面13の途中までの孔15bと連続させて、1つの孔15を形成している。なお、上端面11aは外部干渉材と干渉しやすいが、上記のように0.3mm～0.5mm程度の孔15aを設けているだけでは、これらの孔15aから外部干渉材がコルゲートチューブ10内に挿入できないため、上端面11aの隅部に孔15aを設けても問題はない。各孔15の上端から下端までの寸法（高さ）L2は1～3mmで、本実施形態では1mmとしている。

【0018】上記孔15（15A～15C、16A～16C）はコルゲートチューブ10を樹脂成形した後に、打ち抜き加工で穿設している。この打ち抜き加工で設ける場合、斜面13にのみ孔15をあけることは難しいた

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めに、上端面11aには上記のように僅かに孔15aを食い込ませている。また、このように斜面13にのみ部分的に孔15bを設けるよりも上端面11aにも孔15aを設ける方が、孔15の面積が増大し、軽量化に寄与することができる。

【0019】上記した孔15A～15C、16A～16Cを設けることにより、コルゲートチューブ10の重量を10%～30%軽減することができる。なお、孔15A～15C、16A～16Cを設けることにより、被水領域では孔より浸水が発生するために好ましくない。よって、上記孔をあけるコルゲートチューブは非被水領域に設けることが好ましい。なお、仮に孔より浸水が発生しても、他の孔から排出することができ、コルゲートチューブ内部で水が溜まることはない。

【0020】図6は、コルゲートチューブ10'に長さ方向に連続したスリット20を設けたスリット付きコルゲートチューブ10'である。このスリット付きコルゲートチューブ10'の場合には、スリット20の部分には孔15を設けずに、他の箇所に設けて、スリット20を孔15に連続させないようにしている。

【0021】なお、上記実施形態では、1つの山部の両側を合わせて6個の孔15A～15C、16A～16Cを設けているが、孔の個数は限定されず、2個、4個、8個等でもよく、強度上のバランスをとるために、偶数個数として、コルゲートチューブの主軸をはさんで対称位置に設けることが好ましい。

【0022】

【発明の効果】以上の説明より明らかなように、本発明によれば、コルゲートチューブの最外周の山部の上端面と最内周の谷部の下端面とを連続する斜面において、下端面に達しない途中までに部分的に軽量用の孔をあけているため、コルゲートチューブの減量化を図ることができる。特に、孔は谷部の下端面に達しないようにしているため、内部に挿通するワイヤハーネスに孔のエッジ等を干渉させず、かつ、山部の上端面も一隅部に0.3mm～0.5mm程度の非常に小さい孔があけているだけであるため、外部緩衝材が孔より挿入することが防止でき、これらの点でも問題はない。

【0023】また、山部の両側に設ける孔を隣接するものは、孔の位置を逆としているために、強度上のバランスを取ることもできる。

【図面の簡単な説明】

【図1】 本発明の実施形態のコルゲートチューブを示す斜視図である。

【図2】 図1の平面図である。

【図3】 図2の側面図である。

【図4】 図2の正面図である。

【図5】 要部拡大断面図である。

【図6】 他の実施形態を示す図面である。

【図7】 (A) (B) (C) は従来例を示す図面であ

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る。

【図8】 従来例の用途例を示す斜視図である。

【符号の説明】

10 コルゲートチューブ

11 山部

11a 上端面

12 谷部

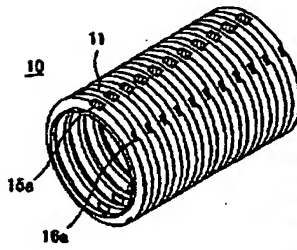
12a 下端面

13 斜面

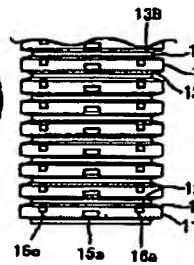
15A~15C、16A~16C 軽量用の孔

20 スリット

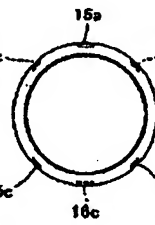
【図1】



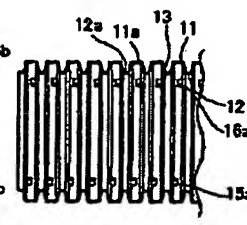
【図2】



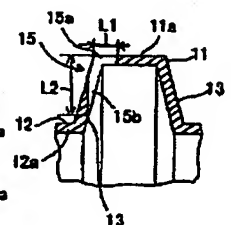
【図3】



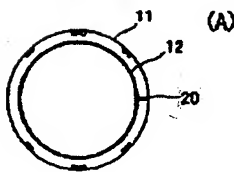
【図4】



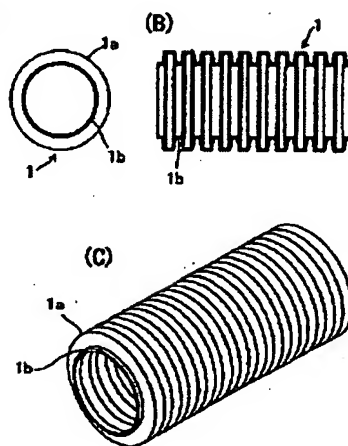
【図5】



【図6】



【図7】



【図8】

